CNHS Higher HW Solutions

Week 8 [29/03/19]

Qs 106 - 120

106. At any point (x, y) on a curve, $\frac{dy}{dx} = 3x^2 + 4x$.

Given that the curve passes through the point (–1, 5), express y in terms of x.

$y = x^3 + 2x^2 + 4$

107. Evaluate $\int_1^2 (x^3 - 2x)dx$.

$\frac{3}{4}$

108. For a curve $y = f(x)$, it is known that $\frac{dy}{dx} = 4x^3 - 3x^2 - 1$ and the curve passes through the point (2, 0). Find the equation of the curve.

(a) $y = x^4 - x^3 - x - 6$

109. Evaluate $\int_4^9 \sqrt{x}dx$.

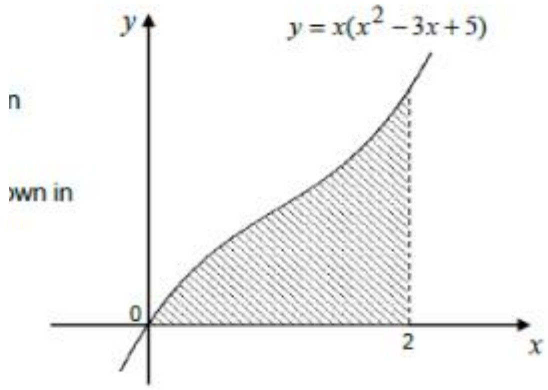
$\frac{38}{3}$

110. (a) Given $f(x) = \frac{6x^5 - 1}{x^2}$, find $f'(x)$.

(b) Find $\int (2x+3)(2x-5)dx$.

(a) $18x^2 + \frac{2}{x^3}$ **(b)** $\frac{4x^3}{3} - 2x^2 - 15x + c$

111. The curve with equation $y = x(x^2 - 3x + 5)$ is shown below.



Calculate the shaded area.

6 units²

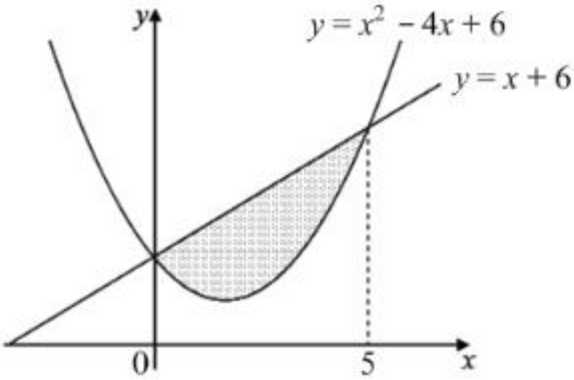
112. Given that $\int_1^a (2x+5)dx = 18$, where $a > 1$, find the value of a.

a = 3

113. Find: (a) $\int \left(6\sqrt{x} + \frac{1}{x^3}\right) dx$ (b) $\int \frac{4x^3 - 1}{x^2} dx$

(a) $4x^{\frac{3}{2}} - \frac{1}{2x^2} + c$ **(b)** $2x^2 + \frac{1}{x} + c$

114. The line with equation $y = x + 6$ and the curve with equation $y = x^2 - 4x + 6$ intersect where $x = 0$ and $x = 5$, as shown in the diagram below.



Calculate the shaded area.

$\int_0^5 5x - x^2\, dx = \left(\frac{5.5^2}{2} - \frac{5^3}{3}\right) - (0) = 20\frac{5}{6}$ $units^2$

115. A curve with equation $y = f(x)$ is such that $\frac{dy}{dx} = 3x^2 - x$.

If the curve passes through the point (2, 11), express y in terms of x.

$y = x^3 - \frac{1}{2}x^2 + 5$

116. (a) Given that $\int_0^p (6x^2 + 6x - 5)dx = 6$, where $p > 0$, show that p satisfies the equation

$2p^3 + 3p^2 - 5p - 6 = 0$.

(b) Solve the equation to find the value of p.

(a) proof (integrate and substitute p and 0) **(b) $p = \frac{3}{2}$**

117. Expand and simplify: (a) $\cos\left(x+\frac{\pi}{6}\right)$ (b) $\sin\left(x+\frac{\pi}{2}\right)$

(a) $\frac{\sqrt{3}}{2}\cos x - \frac{1}{2}\sin x$ (b) cos x

118. The diagram shows a right-angled triangle.
Find the exact value of $\cos 2x$.

$\frac{4}{5}$

119. The acute angle A is such that $\cos A = \frac{1}{\sqrt{5}}$.

Find the exact value of : (a) $\sin 2A$ (b) $\cos 2A$

(a) $\frac{4}{5}$ **(b)** $\frac{-3}{5}$

120. Solve the equation $\sin 2x° - \sin x° = 0$ in the interval $0 \le x \le 360$.

[*Hint*: start by replacing $\sin 2x°$ with a double angle formula]

x = 0^0 60^0 180^0 300^0 360^0